

Pneumonia clinical reports

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Bacteremic pneumococcal pneumonia: arrhythmogenic disease

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Revista Española de Quimioterapia
doi:10.37201/req/s01.23.2022

Sir,

Streptococcus pneumoniae remains the most common cause of community-acquired pneumonia (CAP) [1]. Among pneumonia pathogens, it is the leading cause of hospitalization and death in adults [2]. Around 15–25% of cases of pneumococcal pneumonia (P-CAP) are bacteremic and these patients have worse in-hospital course and outcomes [3]. The development of cardiac complications in general and new-onset atrial fibrillation (AF) in particular has been documented in a substantial number of patients hospitalized for P-CAP and also associated with higher severity and in-hospital mortality [4].

We report a case of a 69-year-old male patient with well functional status, former smoker of 10 packs/year, not vaccinated against flu nor pneumococcus and with arterial hypertension in treatment with valsartan/hydrochlorothiazide. He attended emergency department with a 2-day history of cough with purulent sputum, fever up to 39°C and breathlessness. On physical examination, he presented hypotension of 89/58, tachycardia of 127bpm, fever of 37.8°C, O₂ saturation of 89% and respiratory rate of 32bpm. On pulmonary auscultation he presented right crackles. In the serum chemistry he had a creatinine of 1.8mg/dL, C-reactive protein (CRP) of 373mg/l and procalcitonin of 9.05ng/ml. In the hematology he had 4100 leukocytes/ μ L (80% neutrophils) and the prothrombin index was 39%. In arterial blood gas, the partial pressure of oxygen (pO₂) was 56mmHg. Chest X-ray showed a right upper lobe consolidation. Blood cultures were performed, and urinary antigen rapid test was positive for *S. pneumoniae*. In the electrocardiogram a rapid AF was observed. Pneumonia Severity Index (PSI) [5] was used to assess severity and prognosis of the pneumonia. The score

of the patient was 159 points, indicating class V (high risk). The 2007 Infectious Diseases Society of America/American Thoracic Society Criteria for Defining Severe Community-acquired Pneumonia [6] were also applied, observing that the patient met 3 minor criteria. Considering the result of the severity scales together with clinical judgment, the patient was admitted to the intensive care unit (ICU). He was empirically treated with azithromycin 500mg + ceftriaxone 2g daily according to the recommendations of current guidelines of Spanish Society of Pulmonology [SEPAR] [7]. As the patient had a hypoxemic respiratory failure he was treated with high-flow oxygen therapy. The septic shock did not respond to fluid replacement and the patient needed treatment with vasopressors to restore perfusion and recover renal function. The rapid AF was treated with amiodarone and anticoagulation according to the result of the CHA₂DS₂-VASc score (congestive heart failure, hypertension, age, diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism, vascular disease, age, sex category) of high risk of stroke. After few days of hospital admission, the blood culture result was positive for *S. pneumoniae*, serotype 3. Once clinical and haemodynamic stability was achieved and with the result of the blood culture the antibiotic treatment was de-escalated to ceftriaxone. The in-hospital evolution of the patient was satisfactory; 5 days after admission the high flow oxygen therapy was withdrawn, and the patient was transferred to ward. He was discharged 13th day after admission presenting permanent AF.

S. pneumoniae is the most identified pathogen in pneumonia. Despite the prognosis of P-CAP has improved in recent years due to new vaccines, early diagnosis, and improvements in treatment, it usually causes severe CAP, being responsible for the highest rates of bacteremia, hospital admission and mortality. Bacteremic P-CAP has traditionally been considered an invasive form of infection and previous studies have related it to higher inflammatory status, worse in-hospital course and shorter long-term survival [3].

Organism-related factors play a key role in the clinical

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course of the disease. The capsular polysaccharide is probably the major virulence determinant of *S. pneumoniae*, protecting it from phagocytosis. At present, 100 pneumococcal serotypes have been described based on differences in the antigenic characteristics of capsular polysaccharides. Previous studies have shown that pneumococcal serotypes differ in properties such as resistance to phagocytosis, ability to penetrate into tissues and capacity to activate the inflammatory response and this translates into differences in the severity of the illness and mortality depending on the pneumococcal serotype. Serotype 3 is the most frequent, it has low invasive potential, affecting older patients with comorbidities and it is a high-risk serotype causing higher case-fatality rate. P-CAP caused by serotype 3 is independent risk factor for respiratory failure, bilateral involvement upon radiography, need for mechanical ventilation or septic shock [8]. Sanz et al. [9], developed a prospective, multicenter study of 463 patients with bacteremic P-CAP and high inflammatory level defined for CRP > 15 mg/dl, in which 97 patients (21%) were infected with serotype 3. Patients with P-CAP caused by serotype 3 showed significantly more septic shock, ICU admission, respiratory, systemic, and cardiovascular complications compared to other serotypes.

One important aspect of severe CAP that contributes to worse in-hospital course and mortality are major adverse cardiovascular events. Up to 30% of patients admitted to hospitals with invasive pneumococcal disease experience cardiac complications and new or worsening arrhythmia is the most frequent one. Moreover, pneumococcal bacteremia has been identified to be an independent risk factor for acute cardiovascular events. The elevated inflammatory response in patients with bacteremia is directly associated with its development. The presence of cardiac lesions during the acute invasive pneumococcal infection together with the production of pneumolysin seems to be involved in the genesis of this type of complications. Ruiz et al. [4], in a previous study of our group in a cohort of 1,092 patients with P-CAP, of whom 109 (9.9%) had new-onset AF, have been able to correlate the development of early new-onset AF to bacteremia and severe inflammation. We have observed a progressive increase in AF onset with PSI risk class. Patients who developed new-onset AF had a significantly more prolonged hospital stay, and higher rate of ICU admission and in-hospital mortality. In the same way, failure to restore sinus rhythm was associated with increased in-hospital mortality and lower 6-month survival rate.

After analyzing the severity and risk of short- and long-term complications after bacteremic P-CAP it is clear that we need to make efforts to protect against *S. pneumoniae*, and the best preventive method is vaccination. Nowadays there are two vaccines available against pneumococcus: Pneumococcal Conjugate Vaccine or PCV13 and Pneumococcal Polysaccharide Vaccine or PPSV23. PCV13 has shown higher efficacy and longer duration than PPSV23 in immunocompetent subjects with risk for vaccine serotypes in non-bacteremic CAP, thus as in the bacteremic P-CAP. Risk factors include heart disease,

chronic liver, kidney and respiratory diseases (includes asthma), cancer, diabetes, chronic alcoholism, smoking, transplantation of solid organ or hematopoietic cells, cochlear implants, cerebrospinal fluid fistula, anatomical or functional asplenia and antecedent of bacteremic P-CAP.

In conclusion, bacteremic P-CAP is associated with high severity and worse in hospital course. Serotype 3 is the most frequent and is related to septic shock and respiratory failure. The development of acute cardiovascular events, especially new-onset AF is associated with pneumonia severity, and higher in-hospital and short term mortality. Bacteremia and severe systemic inflammation are factors associated with its development. It is necessary to make efforts to widen pneumococcal vaccination coverage especially in aged patients and/or those with chronic comorbid conditions.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

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